

INTRODUCTION

The atmosphere, the gaseous layer that surrounds the earth, formed over four billion years ago. During the evolution of the solid earth, volcanic eruptions released gases into the developing atmosphere. Assuming the outgassing was similar to that of modern volcanoes, the gases released included: water vapor (H₂O), carbon monoxide (CO), carbon dioxide (CO₂), hydrochloric acid (HCl), methane (CH₄), ammonia (NH₃), nitrogen (N₂) and sulfur gases. The atmosphere was reducing because there was no free oxygen. Most of the hydrogen and helium that outgassed would have eventually escaped into outer space due to the inability of the earth's gravity to hold on to their small masses. There may have also been significant contributions of volatiles from the massive meteoritic bombardments known to have occurred early in the earth's history.

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Water vapor in the atmosphere condensed and rained down, eventually forming lakes and oceans. The oceans provided homes for the earliest organisms which were probably similar to cyanobacteria. Oxygen was released into the atmosphere by these early organisms, and carbon became sequestered in sedimentary rocks. This led to our current oxidizing atmosphere which is comprised of mostly nitrogen (~71%) and oxygen (~28%). Water vapor, argon and carbon dioxide together comprise a much smaller fraction (~1%). The atmosphere also contains several gases in trace amounts, such as helium, neon, methane and nitrous oxide. One very important trace gas is ozone, which absorbs harmful UV radiation from the sun.

